

In the claims:

Cancel claims 2, 7-9, 12 and 16-18.

Amend claims 34-39 where indicated.

1.- 33. (Cancelled)

1 34. (Currently Amended) ~~A magnetic head assembly as claimed in claim 2 further~~
2 ~~comprising: A magnetic head assembly having an air bearing surface (ABS) comprising:~~
3 ~~a read head including:~~
4 ~~first and second ferromagnetic shield layers;~~
5 ~~a read sensor recessed from the ABS and which includes a ferromagnetic free layer;~~
6 ~~a ferromagnetic flux guide magnetically connected to the read sensor and extending~~
7 ~~from the read sensor to the ABS for conducting field signals to the read sensor;~~
8 ~~each of the read sensor and the flux guide being located between ferromagnetic first~~
9 ~~and second shield layers;~~
10 ~~a distance between the first and second shield layers at the ABS being less than a~~
11 ~~distance between the first and second shield layers at the read sensor; and~~
12 ~~a longitudinal biasing stack (LBS) magnetically coupled to the free layer for biasing~~
13 ~~a magnetic moment of the free layer parallel to the ABS and parallel to major planes of the~~
14 ~~layers;~~
15 ~~the LBS including:~~
16 ~~a hard bias layer; and~~
17 ~~a nonmagnetic metal spacer layer located between and interfacing the free layer and~~
18 ~~the hard bias layer;~~
19 each of the free layer, hard bias layer and spacer layer having top and bottom large surfaces
20 which are bounded by front and rear surfaces and first and second side surfaces wherein the front
21 surfaces form a portion of the ABS and each of the top and bottom large surfaces has a larger surface
22 area than each of the front and rear surfaces and each of the first and second side surfaces and is
23 perpendicular thereto; and
24 each of the top and bottom large surfaces of the spacer layer interfacing a respective large
25 surface area of the free layer and the hard bias layer.

1 35. (Currently Amended) ~~A magnetic head assembly as claimed in claim 2 further~~
2 comprising: A magnetic head assembly having an air bearing surface (ABS) comprising:
3 a read head including:
4 first and second ferromagnetic shield layers;
5 a read sensor recessed from the ABS and which includes a ferromagnetic free layer;
6 a ferromagnetic flux guide magnetically connected to the read sensor and extending
7 from the read sensor to the ABS for conducting field signals to the read sensor;
8 each of the read sensor and the flux guide being located between ferromagnetic first
9 and second shield layers;
10 a distance between the first and second shield layers at the ABS being less than a
11 distance between the first and second shield layers at the read sensor; and
12 a longitudinal biasing stack (LBS) magnetically coupled to the free layer for biasing
13 a magnetic moment of the free layer parallel to the ABS and parallel to major planes of the
14 layers;
15 the LBS including:
16 a hard bias layer; and
17 a nonmagnetic metal spacer layer located between and interfacing the free layer and
18 the hard bias layer;
19 the read sensor having a sensor stripe height and the flux guide having a flux guide stripe
20 height; and
21 dielectric layers electrically insulating some of the layers of the read head along the flux
22 guide stripe height except along the sensor stripe height.

1 36. (Previously Presented) A magnetic head assembly as claimed in claim 35 further
2 comprising:
3 each of the free layer, hard bias layer and spacer layer having top and bottom large surfaces
4 which are bounded by front and rear surfaces and first and second side surfaces wherein the front
5 surfaces form a portion of the ABS and each of the top and bottom large surfaces has a larger surface
6 area than each of the front and rear surfaces and each of the first and second side surfaces and is
7 perpendicular thereto; and
8 each of the top and bottom large surfaces of the spacer layer interfacing a respective large
9 surface area of the free layer and the hard bias layer.

1 37. (Currently Amended) A magnetic disk drive as claimed in claim 12 further
2 comprising: A magnetic disk drive including:
3 a read head including:
4 first and second ferromagnetic shield layers;
5 a read sensor recessed from the air bearing surface (ABS) and which includes a
6 ferromagnetic free layer;
7 a ferromagnetic flux guide magnetically connected to the read sensor and extending
8 from the read sensor to the ABS for conducting field signals to the read sensor;
9 each of the read sensor and the flux guide being located between ferromagnetic first
10 and second shield layers;
11 a distance between the first and second shield layers at the ABS being less than a
12 distance between the first and second shield layers at the read sensor; and
13 a longitudinal biasing stack (LBS) magnetically coupled to the free layer for biasing
14 a magnetic moment of the free layer parallel to the ABS and parallel to major planes of the
15 layers;
16 the LBS including:
17 a hard bias layer; and
18 a nonmagnetic metal spacer layer located between and interfacing the free layer and
19 the hard bias layer;
20 each of the free layer, hard bias layer and spacer layer having top and bottom large surfaces
21 which are bounded by front and rear surfaces and first and second side surfaces wherein the front
22 surfaces form a portion of the ABS and each of the top and bottom large surfaces has a larger surface
23 area than each of the front and rear surfaces and each of the first and second side surfaces and is
24 perpendicular thereto; and
25 each of the top and bottom large surfaces of the spacer layer interfacing a respective large
26 surface area of the free layer and the hard bias layer[. . .];
27 a write head including:
28 ferromagnetic first and second pole piece layers that have a yoke portion located
29 between a pole tip portion and a back gap portion;
30 a nonmagnetic write gap layer located between the pole tip portions of the first and
31 second pole piece layers;
32 an insulation stack with at least one coil layer embedded therein located between the
33 yoke portions of the first and second pole piece layers; and

34 the first and second pole piece layers being connected at their back gap portions;
35 a housing;
36 a magnetic disk rotatably supported in the housing;
37 a support mounted in the housing for supporting the magnetic head assembly with said ABS
38 facing the magnetic disk so that the magnetic head assembly is in a transducing relationship with the
39 magnetic disk;
40 a spindle motor for rotating the magnetic disk;
41 an actuator positioning means connected to the support for moving the magnetic head
42 assembly to multiple positions with respect to said magnetic disk; and
43 a processor connected to the magnetic head assembly, to the spindle motor and to the actuator
44 positioning means for exchanging signals with the magnetic head assembly, for controlling
45 movement of the magnetic disk and for controlling the position of the magnetic head assembly.

1 38. (Currently Amended) A ~~magnetic disk drive as claimed in claim 12 further~~
2 comprising: A magnetic disk drive including:
3 a read head including:
4 first and second ferromagnetic shield layers;
5 a read sensor recessed from the air bearing surface (ABS) and which includes a
6 ferromagnetic free layer;
7 a ferromagnetic flux guide magnetically connected to the read sensor and extending
8 from the read sensor to the ABS for conducting field signals to the read sensor;
9 each of the read sensor and the flux guide being located between ferromagnetic first
10 and second shield layers;
11 a distance between the first and second shield layers at the ABS being less than a
12 distance between the first and second shield layers at the read sensor; and
13 a longitudinal biasing stack (LBS) magnetically coupled to the free layer for biasing
14 a magnetic moment of the free layer parallel to the ABS and parallel to major planes of the
15 layers;
16 the LBS including:
17 a hard bias layer; and
18 a nonmagnetic metal spacer layer located between and interfacing the free layer and
19 the hard bias layer;

20 the read sensor having a sensor stripe height and the flux guide stripe
21 height; and

22 dielectric layers electrically insulating some of the layers of the read head along the flux
23 guide stripe height except along the sensor stripe height[. . .];

24 a write head including:

25 ferromagnetic first and second pole piece layers that have a yoke portion located
26 between a pole tip portion and a back gap portion;

27 a nonmagnetic write gap layer located between the pole tip portions of the first and
28 second pole piece layers;

29 an insulation stack with at least one coil layer embedded therein located between the
30 yoke portions of the first and second pole piece layers; and

31 the first and second pole piece layers being connected at their back gap portions;

32 a housing;

33 a magnetic disk rotatably supported in the housing;

34 a support mounted in the housing for supporting the magnetic head assembly with said ABS
35 facing the magnetic disk so that the magnetic head assembly is in a transducing relationship with the
36 magnetic disk;

37 a spindle motor for rotating the magnetic disk;

38 an actuator positioning means connected to the support for moving the magnetic head
39 assembly to multiple positions with respect to said magnetic disk; and

40 a processor connected to the magnetic head assembly, to the spindle motor and to the actuator
41 positioning means for exchanging signals with the magnetic head assembly, for controlling
42 movement of the magnetic disk and for controlling the position of the magnetic head assembly.

1 39. (Currently Amended) A magnetic head assembly disk drive as claimed in claim
2 38 further comprising:

3 each of the free layer, hard bias layer and spacer layer having top and bottom large surfaces
4 which are bounded by front and rear surfaces and first and second side surfaces wherein the front
5 surfaces form a portion of the ABS and each of the top and bottom large surfaces has a larger surface
6 area than each of the front and rear surfaces and each of the first and second side surfaces and is
7 perpendicular thereto; and

8 each of the top and bottom large surfaces of the spacer layer interfacing a respective large
9 surface area of the free layer and the hard bias layer.

Add new claims 40-47.

1 40. (New) A magnetic head assembly as claimed in claim 34 further comprising:
2 the flux guide including an extension of the free layer which extends from the sensor to the
3 ABS;
4 the read sensor further including:
5 a ferromagnetic pinned layer that has a magnetic moment;
6 an antiferromagnetic pinning layer exchange coupled to the pinned layer for pinning
7 the magnetic moment of the pinned layer; and
8 a spacer layer located between the pinned layer and said free layer; and
9 said pinned layer, pinning layer and spacer layer being located only in said read sensor.

1 41. (New) A magnetic head assembly as claimed in claim 40 wherein the spacer layer
2 is a nonmagnetic electrically nonconductive barrier layer.

1 42. (New) A magnetic head assembly as claimed in claim 35 further comprising:
2 the flux guide including an extension of the free layer which extends from the sensor to the
3 ABS;
4 the read sensor further including:
5 a ferromagnetic pinned layer that has a magnetic moment;
6 an antiferromagnetic pinning layer exchange coupled to the pinned layer for pinning
7 the magnetic moment of the pinned layer; and
8 a spacer layer located between the pinned layer and said free layer; and
9 said pinned layer, pinning layer and spacer layer being located only in said read sensor.

1 43. (New) A magnetic head assembly as claimed in claim 42 wherein the spacer layer
2 is a nonmagnetic electrically nonconductive barrier layer.

1 44. (New) A magnetic disk drive as claimed in claim 37 further comprising:
2 the flux guide including an extension of the free layer which extends from the sensor to the
3 ABS;
4 the read sensor further including:
5 a ferromagnetic pinned layer that has a magnetic moment;

6 an antiferromagnetic pinning layer exchange coupled to the pinned layer for pinning
7 the magnetic moment of the pinned layer; and

8 a spacer layer located between the pinned layer and said free layer; and
9 said pinned layer, pinning layer and spacer layer being located only in said read sensor.

1 45. (New) A magnetic disk drive as claimed in claim 44 wherein the spacer layer is a
2 nonmagnetic electrically nonconductive barrier layer.

1 46. (New) A magnetic disk drive as claimed in claim 38 further comprising:
2 the flux guide including an extension of the free layer which extends from the sensor to the
3 ABS;

4 the read sensor further including:

5 a ferromagnetic pinned layer that has a magnetic moment;
6 an antiferromagnetic pinning layer exchange coupled to the pinned layer for pinning
7 the magnetic moment of the pinned layer; and

8 a spacer layer located between the pinned layer and said free layer; and
9 said pinned layer, pinning layer and spacer layer being located only in said read sensor.

1 47. (New) A magnetic disk drive as claimed in claim 46 wherein the spacer layer is a
2 nonmagnetic electrically nonconductive barrier layer.